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ABSTRACT

An age-related decline in performance is typically observed in research on tasks that rely on cognitive processing. However, such declines must not be accepted as indisputable evidence that the learning efficiency of older adults is necessarily impaired. Cognitive factors such as a production deficiency in long-term memory and/or a retrieval deficiency do operate to depress the performance of older adults. However, a number of noncognitive factors such as functional and pathological sensory deficits, psychomotor slowing, poor physical and mental health, and insufficient or excessively high motivation also mitigate against optimal performance in the aged. The learning efficiency of the aged may be improved through the use of teaching and learning techniques designed to compensate for the negative effects of both detrimental cognitive and noncognitive factors. (Author)

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A Cognitive Problem-Solving Approach to Learning in Later Adulthood

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A Cognitive Problem-Solving Approach to Learning in Later Adulthood

When addressing age-related changes in performance from a cognitive problem-solving approach, one is inevitably dealing with declines. Whether we are concerned with intelligence, short-term memory, long-term memory, thinking, concept formation, or problem solving, the available research evidence is almost overwhelmingly consistent with the common stereotype that functioning becomes poorer with increased age. It is our contention, however, that such findings must not be accepted as indisputable evidence that the cognitive efficiency of older adults is necessarily impaired.

It is extremely important to keep in mind that most studies demonstrating a decline in cognitive functioning with increased age are really demonstrating that a certain group of older individuals is performing more poorly than a certain group of younger individuals; that is, these studies are cross sectional. When younger people are followed through life in longitudinal studies, evidence for declines is often nonexistent, except perhaps for measures dependent on speed (Schaie & Strother, 1968), or not apparent until a short period of time prior to death (see Siegler, 1975).

Educators and researchers concerned with an older adult population must ask themselves which factors, other than age, might also account for the differences in performance typically observed between a younger and and an older adult group. Being cognizant of both cognitive factors

(such as changes in memory storage and retrieval) and noncognitive factors (such as sensory deficits and motivational changes) will allow the development of compensatory techniques that could potentially raise the level of performance of an older group to at least that achieved by a younger group.

Since the most crucial factor for cognitive processing (from an information-processing point of view) involves, first of all, getting information registered peripherally and then passed into the central processing system, attention must be given to sensory deficits that occur among the aged and the role these play in limiting the input of information. Certainly, if information is not perceived, it will not be available for the cognitive processing that we are interested in. And there is good evidence that functional declines in sensory abilities do occur inevitably as age advances. For example, hearing loss for high frequency sounds as age increases was observed by Galton in 1884, and has been well documented since then. Also, visual acuity declines, and touch, taste, and smell suffer from physical changes resulting in decreased sensitivity (see Bromley, 1974). Such functional changes, while undoubtedly causing decreases in informational inputs (see Bergman, Blumenfeld, Cascardo, Dash, Levitt, & Margulies, 1976), are probably far less important than sensory deficits resulting from undiagnosed pathological conditions. Decker (1974), for example, found that over 70 percent of patients over 50 years of age who were admitted to a rehabilitation medicine department of a large hospital had hearing losses sufficient to prevent

them from interacting in a satisfactory manner with those around them. The hearing problem had been diagnosed for very few of these individuals, and adequate corrective measures taken for only a portion of these. It is simply too easy for an elderly person to say "I'm getting old and my hearing is getting bad," and hence dismiss as untreatable what is possibly a very real and reversible problem. Thus, a decline in such abilities as IQ test performance becomes attributed to age per se rather than the sensory deficit (Granick, Kleban, & Weiss, 1976; Snyder, Pyrek, & Smith, 1976) and other relevant factors.

Some sensory deficits of the aged can be reversed through medical treatment, but what can be done to compensate for those that cannot. One possibility is that a multisensory approach could be tried in a verbal learning situation. Arenberg (1968, 1977), for example, has found that a combined auditory and visual presentation leads to better performance on a memory task than visual presentation alone. Also, he found that reading visually presented material aloud leads to better evidence of retention than reading silently (Arenberg, 1968). Using more than one sense modality may help insure that information enters the cognitive processing system, and is available for use at a later time.

In addition, we must consider that some compensation for sensory deficits will take place under normal circumstances. In familiar surroundings, increased experience should lead to decreased reliance on sensory cues. An elderly woman who develops a visual handicap may

be able to function well in her own home because her everyday activities depend more on past learning than on new sensory information. However, unfamiliar stimuli and surroundings would present an entirely different situation and be far more problematic to the elderly person (see Howell, 1972; Wetherick, 1975). Here the person providing new sensory information must be more ingenious about maximizing the chances that the information is fully perceived and recognized. Also, distraction must be reduced in such situations (see Rabbitt, 1965).

Once information has been received by the sensory systems, it must be identified as meaningful and subjected to further central, cognitive processing, or else simply ignored. Harwood and Naylor (1969a) have done some extremely interesting research in which they have attempted to measure the maximum rate of information acceptance; that is, "the greatest amount of sensory stimulation which can be accepted for CDP (cerebral data processing) in any unit of time." Three perceptual tasks of varying complexity were presented to 185 noninstitutionalized, volunteer subjects ranging in age from 60 to 90 years, and 42 young adult subjects, 18 to 25 years of age who were mostly university students. Each subject controlled the exposure time of a visual stimulus. The exposure time needed and subsequent amount of recall of information were then used to calculate the maximum rate of information acceptance. This rate was observed to be lower in elderly than in young adults, and to decline consistently through the seventh, eighth, and ninth decades. The rate of decline was greater with perceptual material of an unfamiliar

nature, and when the information had to be accepted from more than one source simultaneously. Since the rate of information acceptance was correlated with all WAIS subtest scores, Harwood and Naylor (1969a) have concluded that "the effectiveness of much, if not all, cognitive function may be limited to rate of information acceptance."

If the maximum rate of information acceptance is reduced among the elderly, what measures can be taken to obtain optimal performance on a cognitive task? Apparently, older adults need more time. A number of paced versus self-paced and temporal manipulation studies have demonstrated that the discrepancy between older and younger subjects for scores on learning tasks tends to be reduced under lenient or self-paced temporal schedules, or that extended and self-paced schedules result in improved learning scores for older persons (e.g., Arenberg, 1965; Calhoun & Gounard, Note 2; Canestrari, 1965; Eisdorfer, 1965; Hulicka, Sterns, & Grossman, 1967; Monge & Hultsch, 1971; Witte, 1975). While traditionally these studies have been interpreted as evidence that the older person needs more response time than the young subject does, some evidence exists to show that the older person uses extra time, or increased flexibility in timing, to receive and store incoming information (Hulicka, Sterns, & Grossman, 1967; Hulicka & Wheeler, 1976).

As far as response time is concerned, Mortimer-Tanner and Naylor (1973) have shown that the maximum rate of executing a response in a visual discrimination task is approximately 20 percent slower for elderly subjects (aged mainly between 65 and 75 years) than for young

subjects (18 to 25 years). Maximum rate of effective response is also correlated with WAIS Performance scores--the scores that are most subject to decline in the elderly (Harwood & Naylor, 1971).

Irreversible psychomotor slowing is a generally accepted functional change in the aged. Estimates of the amount of decline range from 20 to 110 percent (see Hicks & Birren, 1970). Even when elderly subjects are given extensive practice, they are unable to bring the speed of their responses up to the level of young subjects. However, the fact must not be overlooked that elderly subjects can, indeed, show improvement in response speed (see Baltes & Barton, Note 1 for a review).

In addition to the time factors involved in getting information available for central processing and getting responses made, which obviously mitigate against optimal performance among the aged, one must consider the cognitive processing itself. Are there qualitative or simply quantitative differences in the way that old and young adults input, store, and retrieve information? This question has important educational implications since quantitative differences would indicate that the educational techniques used with young students are also appropriate for the old. The only modification required is that expectations regarding the average performance of a group must be reduced, and perhaps the relative emphasis given to different aspects of the situation altered. On the other hand, the existence of qualitative differences--differences in the kind rather than the amount of storage

and retrieval processing--would require the formulation of brand new and more effective teaching and learning techniques for the elderly.

At present, the question of quantitative or qualitative differences has not been resolved. As Hultsch (Note 3) has reviewed, sensory and short-term memory seem to be less affected by increasing age than long-term memory and retrieval. Both a production-deficiency and a retrieval-deficiency hypothesis have received support in the research literature to explain the differences that are observed. That is, older people are less likely than young people to use mediators, mnemonic devices, and other strategies to facilitate their memory performance (e.g., Hulicka & Grossman, 1967). Also, older people are more likely than young people to have difficulty recalling material that they actually know (as demonstrated by their performance on a recognition test; Harwood & Naylor, 1969b; Schonfield & Robertson, 1966).

Both a production deficiency and a retrieval deficiency can be partially compensated for through the use of strategy training and cued recall, and they do not necessarily constitute qualitative differences in cognitive processing.

In practical terms, the existence of a production and/or retrieval deficiency suggests that a review of common strategies for learning the particular task at hand would be especially useful for the older adult who is being presented with a new task or a task he has not done for a long time. As several researchers have pointed out (Goulet, 1972; Hultsch, 1974; Monge, 1969), "learning to learn" may be an important

variable in explaining age differences in learning. While college students may not have had much experience learning a nonsense syllable list, for example, the task certainly relies more on the past verbal learning experiences required in their college curriculum than it does on the recent learning activities of most 60-to 80-year-olds.

Returning now to noncognitive factors that must not be overlooked when examining performance on a cognitive task, we will first consider health status. No investigator would conclude that certain aspects of cognitive functioning deteriorate with increased age on the basis of comparison of the performance of normal 7-year-old public school children and 12-year-old children institutionalized for chronic physical conditions. Yet, some of the support for the hypothesis that learning efficiency declines with age comes from studies in which the elderly subjects have been unselected for health or hospitalization, whereas the young subjects have been drawn from school or community groups. It may be assumed that such subject selection procedures result in a higher incidence of physiological malfunctioning in the older than in the younger groups. Evidence that physiological malfunctioning may depress efficiency of cognitive functioning has been provided by a variety of studies (Abrahams, 1976; Botwinick & Birren, 1963; Jacobs, Winter, Alvis, & Small, 1969; Rust, 1965). Hulicka (1967b) conducted a study in which healthy and hospitalized persons in a wide age range were tested on four learning-memory tasks. Patients aged 17 to 85 years demonstrated the typical decline in performance as a

function of age; however, when the effects of health status, as estimated by number of diagnoses and months of hospitalization during the preceeding 5 years, were partialled out by analysis of covariance, the relationship between age and performance scores was eliminated. In the same study, healthy groups outperformed like-aged hospitalized groups on all tasks; and the performance of healthy 60-year-olds compared favorably with that of healthy college students on three out of four tasks. The most interesting comparison was between hospitalized 20-year-olds, and community resident, healthy 60-year-olds; the healthy 60-year-olds actually outperformed the hospitalized 20-year-olds on three of the tasks.

The emotional health of individuals is also usually ignored as a possible factor in accounting for age-related declines in cognitive functioning. The high frequency with which losses occur for the aged (e.g., loss of spouse, loss of physical health, loss of accustomed living environment, loss of job through retirement, etc.) predispose to depression. In fact, Pfeiffer and Busse (1973; see also Epstein, 1976) state that the incidence of affective disorders ranges from 10 to 65 percent among hospitalized and community-resident older persons. Such depressions may lead to confusion, poor memory, and other cognitive impairments.

Lack of motivation is another noncognitive factor that has been used to explain poor performance of older adults on cognitive tasks. It seems to be generally assumed (although not supported by the avail-

able research; Gribbin & Schaie, 1976) that one must offer a monetary incentive to older subjects in order to gain their full cooperation on research tasks. There is some evidence (Hulicka & Rust, 1964) that older people are more likely than young people to be insulted if asked to learn or remember nonsensical material. Sometimes the statement "I've got better things to do with my time" is made. Hulicka (1967a) tried to teach a paired-associate learning task in which response terms such as "insane" were paired with stimulus terms such as "TL". The subject attrition rate was high and the number of trials to criterion excessive until the task was made more meaningful by substituting personal surnames and occupation names.

Contradicting the hypothesis that older adults are less motivated than young is the work of Eisdorfer and his colleagues (e.g., Eisdorfer, Nowlin, & Wilkie, 1970). Their research, involving the study of physiological indices of arousal indicates that older people become so involved in laboratory research tasks that their involvement is a detriment to good performance.

Perhaps the resolution between these two opposing points of view lies in the intrinsic meaningfulness of the task, and the value attributed by the person to doing well on any given task

Okun and DiVesta (1976) observed that elderly subjects were more cautious than young subjects, and suggested that older subjects try to protect themselves from tasks that would result in self-evaluation of important ability dimensions. Such behavior could be interpreted as in-

dicating a lack of motivation to do the task. What would happen then when subjects are required to perform tasks that could potentially result in a negative self-evaluation? It seems plausible that anxiety may rise to such a level that performance declines through overarousal.

The above material has covered a number of factors--both cognitive and noncognitive--that may be involved in age-related declines in task performance based on cognitive functioning. In conclusion, the following practical suggestions, derived from the research reviewed, are offered for improving the learning efficiency of older adults. All may be levant to any age group, but they are especially important for the older adult.

1. Be sure that the information you are presenting is being perceived. If necessary, try a multisensory approach since two senses may be better than one.

2. Be alert to the difference between functional and pathological changes in sensory functioning. Increasing stimulation intensity may help compensate for both, but the latter should be investigated for possible corrective measures.

3. Allow more time--both to take information in and to get responses out. Keep time pressure at a minimum but also keep sessions short.

4. Structure the learning situation to take advantage of past related experiences. Remember that elderly individuals have a lifetime of experience that you can capitalize on.

5. Use familiar cues and review task strategies that may have been

lost through lack of practice. Instruct the students in the use of appropriate mnemonic devices.

6. Reduce distraction. Complete information coming from a single source is more readily attended to than partial information coming from several different sources.

7. Test retention through the use of procedures relying on recognition rather than recall--multiple choice rather than essay tests in the classroom. Train individuals to maximize their ability to demonstrate retention through the use of prompted recall.

8. Remember that on the whole, verbal abilities are maintained better throughout life than nonverbal abilities. However, also be sensitive to individual differences that can occur.

9. Keep the subject matter brief, meaningful, and interesting.

10. Progress from tasks the individual can do well to those more difficult.

11. Do not add to the older person's sense of loss. Treat your students in a way that instills confidence and self-respect (by all means avoid such terms of address as "Dearie" or "Grandma"). Don't allow people to feel defeated before they start. You <u>can</u> teach an old dog new tricks if you handle the situation the right way.

12. Finally, maintain levity. A laugh goes a long way in reducing tensions and increasing motivation.

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